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crease in visibility and that with further observation some estimate can be made of the diameter of these stars.

Assuming that the effective wave-length of α Orionis is 5.75×10^5 cm. and that the value of d is 121 inches (306.5 cm.), the angular diameter of α Orionis from the formula $\alpha = 1.22 \frac{\lambda}{d}$ proves to be 0.047. An estimate of its linear diameter may be made by using a mean parallax of $0''.018$,[3] which gives a diameter of 240×10^6 miles, or slightly less than that of the diameter of the orbit of Mars.

Corrections to this value will be derived by an experimental determination of the value of λ for this particular star; by a more accurate setting of the mirrors, for the uncertainty of this measure is at least 10 per cent; and by further determination of the parallax. The angular value given above is that corresponding to a uniformly illuminated disk. A darkening toward the limb, equal to that of the sun, would require an increase in the diameter of about 17 per cent.

We wish to express our obligations to Director Hale both for his encouragement and for placing the resources of the observatory at our disposal, and to Mr. J. A. Anderson for his checking of the measures on the night of December 13.

[1]These PROCEEDINGS, **6,** 1920 (474–475).

[2]*Mount Wilson Contributions,* No. 185; *Astroph. J. Chicago,* **51,** 1920 (263–275).

[3]The weighted mean of Adam's spectroscopic parallax, 0.012 and the trigonometric parallaxes of Elkin, 0.030, and Schlesinger, 0.016.

AN OVERLOOKED INFINITE SYSTEM OF GROUPS OF ORDER pq^2

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The determination of all the possible abstract groups of order pq^2 p and q being distinct prime numbers, was considered by Cole and Glover in an article published in the *American Journal of Mathematics,* vol. 15 (1893), p. 191 and by O. Hölder in a long article published in the *Mathematische Annalen,* vol. 43 (1893), p. 301. In a subsequent article, published in volume 46 of the latter journal, Hölder directed attention in foot-note on page 323 to the fact that the enumeration of these groups contained in the former of the two articles mentioned above was incomplete.

The main object of the present article is to establish the fact that there is an infinite system of abstract groups of order pq^2 which was overlooked not only by the authors already mentioned but also by others, including W. Burnside who gave an incomplete list of these groups in both editions of his well known and meritorious work entitled, "Theory of Groups of

Finite Order" 1897 and 1911. The system of groups in question consists of $q-1$ distinct groups for all values of p and q which satisfy certain conditions to be noted later while only one such group is given in the published lists. This system of groups is also interesting in view of the fact that each group of the system contains q characteristic operators including the identity.

To construct the groups of the system in question suppose that q is a divisor of $p-1$ and establish a simple isomorphism between q cyclic groups of order pq written as regular substitution groups. Let t represent the substitution of order q which permutes the corresponding letters of these q cyclic groups so that t is commutative with each of its substitutions and together with the cyclic group of order pq formed by the given isomorphism generates a regular abelian group of order pq^2. Let S_1 S_2..... S_q be substitutions of order q and of degree $pq-q$ which transform corresponding generators of the given cyclic groups of order pq into the same power belonging to exponent q modulo pq and so chosen that the product S_1 S_2...S_q is commutative with t. Finally let S_0 represent a substitution of order q contained in the first one of the q given cyclic groups of order pq.

The product $S_0S_1S_2...S_qt$ is a substitution of order q^2 whose q^{th} power is the substitution of order q, in the group formed by means of the said isomorphism, whose constituent is S_0. Hence it results that the pq substitutions of the group of order pq^2 thus constructed which transform into a given power belonging to exponent q modulo pq a generator of the given cyclic group of order pq can be so chosen that their q^{th} power is an arbitrary operator of order q contained in this cyclic group. The totality of these pq substitutions must correspond to itself in every automorphism of this group of order pq^2. Hence this q^{th} power must be a characteristic operator of the group.

From the preceding paragraph it results that each of the groups of order pq^2 under consideration contains q characteristic operators including the identity and that any of these operators which is of order q can be made the q^{th} power of all the pq operators of the group which transform the operators of order p in the group into a particular power. Hence there are $q-1$ distinct groups for particular values of p and q which satisfy the conditions that p and q are such primes that $p-1$ is divisible by q. These $q-1$ groups are conformal: that is, they contain the same number operators of each order. It is well known that for any prime number of q there is an infinite number of prime numbers p such that $p-1$ is divisible by q and hence there is no upper limit to the number of such distinct conformal groups.

The smallest order for which there exist at least two such conformal groups is 63. In this special case one of the characteristic operators of order 3 is the third power of the operators of order 9 which transform the operators of order 7 into their fourth powers while the other operator of order 3 is the third power of those which transform the operators of

order 7 into their squares in one of the two conformal groups. In the other group the reverse is true. Hence it is not possible to establish a simple isomorphism between the operators of these two groups. In view of the elementary properties of these groups it appears strange that the wide-spread error noted above was not corrected for more than a quarter of a century, especially since the incorrect results obtained by O. Hölder have been used by various writers in extending his work.

THE GLOBE, A SIMPLE TRISOMIC MUTANT IN DATURA

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Communicated by C. B. Davenport, March 10, 1921

In a series of articles already published,[1, 2, 3] or at the present writing in press (*American Naturalist, Genetics*), a number of recurrent mutants discovered in the Jimson Weed (*Datura Stramonium*) have been described and their peculiarities in external appearance shown to be connected with the presence of one or more extra chromosomes in their nuclei. Evidence has been presented which indicates that a given mutant of the "simple trisomic" type is conditioned by the presence of a single extra chromosome in a specific one of the 12 chromosomal sets. Such a form is called a simple trisomic mutant since in its somatic nucleus one of the 12 sets is a trisome with three homologous chromosomes instead of all the sets being disomes with two chromosomes each. The presence of an extra chromosome in a specific chromosomal set not only causes specific peculiarities in the growth and appearance of the mutant which results, but also brings about peculiarities in the inheritance of the mutant complex.

It is the purpose in the present paper to summarize the findings in regard to one of the simple trisomic mutants—the Globe—in anticipation of a more detailed paper to be published shortly in *Genetics*. The data were accumulated for the most part before the chromosomal condition in the Globe and other simple trisomic mutants had been determined by my colleague, Mr. John Belling, from studies of mitotic figures in the pollen mother cells.

The Globe was the first mutant recognized in the Jimson Weed, having been discovered in 1915. Its depressed globose capsules suggested the name. Its adult characters as well as the broad entire leaves of its seedlings render the Globe one of the easiest mutants to recognize at any stage of development. It is the only one in fact that we have been able to pick out readily in the seed pan. Since usually it has not been necessary to grow plants beyond an early seedling stage when it is desired to distinguish Globes from normals, it has been possible with this mutant to base conclusions on a larger number of individuals than could readily have been obtained if we had been dealing with the other mutant forms.